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## Original Research

# Course, Diagnosis, and Treatment of Depressive Symptomatology in Workers Following a Workplace Injury: A Prospective Cohort Study

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**Objectives:** To estimate prevalence, incidence, and course of depressive symptoms and prevalence of mental health treatment following a workplace injury, and to estimate the association between depressive symptoms and return-to-work (RTW) trajectories.

**Method:** In a prospective cohort study, workers filing a lost-time compensation claim for a work-related musculoskeletal disorder of the back or upper extremity were interviewed 1 month ( $n = 599$ ) and 6 months ( $n = 430$ ) postinjury. A high level of depressive symptoms was defined as 16 or more on the self-reported Center for Epidemiologic Studies—Depression (CES-D) Scale. The following estimates are reported: prevalence of high depressive symptom levels at 1 and 6 months postinjury; incidence, resolution, and persistence of high depressive symptom levels between 1 and 6 months; and prevalence of self-reported mental health treatment and depression diagnosis at 6 months postinjury.

**Results:** Prevalence of high depressive symptom levels at 1 month and 6 months postinjury were 42.9% (95% CI 38.9% to 46.9%) and 26.5% (95% CI 22.3% to 30.7%), respectively. Among participants reporting high depressive symptom levels at 1 month postinjury, 47.2% (95% CI 39.9% to 54.5%) experienced a persistence of symptoms 6 months postinjury. By 6 months, 38.6% of workers who never returned to work or had work disability recurrences had high depressive symptom levels, compared with 17.7% of those with a sustained RTW trajectory. At 6-month follow-up, 12.9% (95% CI 5.8% to 20.1%) of participants with persistently high depressive symptom levels self-reported a depression diagnosis since injury and 23.8% (95% CI 14.7% to 32.9%) were receiving depression treatment.

**Conclusions:** Depressive symptoms are pervasive in workers with musculoskeletal injuries, but transient for some, and seldom diagnosed as depression or treated.

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### Clinical Implications

- Increased levels of depressive symptoms are highly prevalent in workers following a workplace injury. This is particularly true in the immediate weeks following an injury and in workers who later experience difficulties returning and staying at work.
- Workers with high depressive symptom levels shortly after injury split into 2 trajectory groups by 6 months postinjury: workers with transient depressive symptoms who may require supportive counselling by a health professional, and workers with persistent depressive symptoms who may require specialty treatment.
- There appears to be an underdiagnosis and undertreatment of depression in injured workers.

### Limitations

- Selection and attrition bias analyses suggest that the generalizability of results may be limited for younger workers, male workers, or workers with a shorter duration of work absence.
- Data on receipt of a depression diagnosis and mental health treatment were based on self-report.
- Depressive symptoms were measured using the validated self-reported CES-D Scale, not a standardized and validated diagnostic interview.

**Key Words:** depression, return-to-work, work-related injury, workers' compensation

The economic and work-related impacts of occupational injuries have been studied extensively, but, surprisingly, their relation with mental health has been evaluated to a lesser degree.<sup>1</sup> In 2005, 337 930 workplace injuries resulted in accepted lost-time workers' compensation claims in Canada.<sup>2</sup>

Studies examining the mental health aspect of occupational injury have demonstrated the presence of depressive symptoms following a workplace injury is associated with a longer duration before first RTW,<sup>3</sup> recurrences of work absence,<sup>4</sup> and increased time receiving wage replacement benefits.<sup>5,6</sup> For the injured worker who returns to work, enduring depressive symptoms may adversely affect work performance, resulting in presenteeism.<sup>7,8</sup> The personal cost of depression cannot be underestimated. Depression has been shown to be the second most impairing chronic medical disorder and takes a significant toll on social and intimate relationships.<sup>9</sup>

Little is known about the prevalence and course of depression or depressive symptoms in workers following a work-related musculoskeletal injury, injuries that make up over 70% of all lost-time claims in Canada.<sup>2</sup> In the few studies conducted, prevalence estimates range from 31% to 55%,<sup>10,11</sup> much higher than the prevalence of clinical depression estimated in the general working population (2% to 6.6%).<sup>8,12</sup> However, studies conducted with injured workers have been limited by their cross-sectional design. To our knowledge, no published longitudinal study has examined the course of depressive symptoms, including their incidence and persistence, following a workplace injury.

There are gaps in the injured worker literature regarding health care use for depression. It is well known that, despite the high cost of untreated depressive disorders, primary care physicians detect only 24% to 64% of patients with major depression.<sup>13-18</sup> However, studies documenting the prevalence of diagnosis and treatment in the injured worker population are scant. In one study involving a review of insurer-based records of compensation claimants with musculoskeletal injuries,<sup>19</sup> a depression diagnosis was noted for 16% of workers and, of those, 40% received therapeutic action for depression.

The objectives of our study, conducted using a cohort of workers with back and upper extremity workplace injuries,

were 3-fold: to estimate the prevalence, incidence, and course of depressive symptoms during 6 months postinjury; to estimate the prevalence of mental health treatment use 6 months postinjury; and to estimate the association between depressive symptoms and RTW trajectories.

## Method

### Population

Data were collected through a prospective cohort study of Ontario workers filing a new WSIB lost-time claim (accepted or pending) for a work-related musculoskeletal disorder of the back or upper extremity. Workers were eligible to participate if they reported an absence from work of at least 5 days in the first 14 days following injury and were aged 15 years or older. Claimants with severe injuries (for example, fractures or amputations), unable to understand or speak English, posing a security problem, or receiving institutional care were ineligible.

### Recruitment Procedure

Recruitment and eligibility screening occurred in a 3-stage process, previously described in detail elsewhere.<sup>20,21</sup> In the first 2 stages, potential participants were screened for eligibility and contacted by WSIB personnel to determine their interest in participating in the study and asked for their permission to be contacted by a university-based survey unit. Claimants in agreement were sent an information sheet and consent form and assured study participation would not affect how they were treated by the WSIB, their employer, or health care provider. In stage 3, potential participants were telephoned by an interviewer who explained what participation in the study involved, requested verbal consent to complete the interview, and performed a final eligibility screen. The study was approved by the University of Toronto Ethics Review Board.

The final sample consisted of 632 eligible claimants who successfully completed the baseline telephone interview. The overall response rate was 61% (632 of 1038 eligible and contacted potential participants). This approach to reporting participation rate, where the number of eligible and contacted potential participants is used as the denominator, is typically used in comparable cohort studies of work-disabled workers.<sup>22,23</sup> A detailed description of the flow of participants is found elsewhere.<sup>20,21</sup>

### Data Collection

The first data source were telephone interviews focusing on workers' RTW and injury experience, conducted at about 1 month (baseline) and 6 months postinjury. Mean time from injury to baseline interview was 29.6 days (SD 6.2, range 15 to 46), with 61.4% of participants interviewed within 30 days postinjury and 98.9% within 6 weeks. The mean time from

### Abbreviations used in this article

CES-D	Center for Epidemiologic Studies—Depression
RTW	return-to-work
RTW-R	return-to-work with recurrence(s) of work absence
RTW-S	sustained first return-to-work
WSIB	Workplace Safety and Insurance Board of Ontario

injury to 6-month interview was 178.0 days (SD 11.1, range 157 to 215), with 64.6% of participants interviewed within 180 days and 99.6% interviewed within 210 days postinjury. The second data source was WSIB administrative data, consisting of sociodemographic, workplace, and claim information. Data were linked to interview data only when written consent for linkage was provided ( $n = 481$ ).

### **Main Study Variables**

Depressive symptoms were measured at baseline and 6 months postinjury using the CES-D Scale,<sup>24</sup> a widely used, self-report instrument. For each of 20 depression symptoms, frequency of occurrence in the past week is measured using a 4-point scale ranging from less than 1 day to 5 to 7 days. CES-D scores range from 0 to 60, with higher scores indicating the presence of more depressive symptoms. Throughout our paper, a high level of depressive symptoms is defined as a CES-D score of 16 or greater, as this cut-off point has been shown to be indicative of an increased risk for clinical depression.<sup>24</sup> A self-report scale cannot replace a diagnostic interview provided by a trained professional. However, several studies<sup>25–27</sup> have examined the relation between the CES-D and a depression diagnosis based on a semi-structured diagnostic interview. In these studies, the sensitivity of a CES-D cut-off of 16 in correctly identifying people with depression has ranged from 64% to 88%, while the specificity has ranged from 50% to 94%. Positive predictive values ranged between 33%<sup>25</sup> and 63.3%,<sup>26</sup> and the negative predictive value was 78.1% in one study.<sup>26</sup> The internal consistency Cronbach's alpha was 0.92 at baseline.

At 6-month follow-up, self-reported depression diagnosis since injury was measured with 1 question: "Since your injury, have you been diagnosed with depression?" and current use of antidepressants and consultation with a health professional regarding emotional health were measured by self-reported yes or no questions.

### **Other Variables**

Sociodemographic, workplace, injury, and health variables were obtained from WSIB administrative data and self-report interview data, using valid and reliable scales when available.<sup>28–30</sup>

### **RTW Status**

Self-reported RTW status at baseline and 6 months postinjury was categorized as sustained first RTW or RTW-S (those who returned to work and remained at work after their first RTW attempt); RTW with recurrence(s) of work absence or RTW-R (those who returned to work, did not remain at work after their first RTW attempt, and may or may not be at work at the time of interview); and No RTW (those who have never made an RTW attempt).

### **Pain Intensity**

One item from the Von Korff Pain Scale<sup>30</sup> was used to measure perceived pain intensity at the present time. Participants were asked to rate their current level of pain owing to their workplace injury on a 10-point rating scale (0 = no pain to 10 = pain as bad as could be).

### **Functional Status and Primary Pain Site**

Functional disability was measured using the Roland Morris Disability Questionnaire<sup>29</sup> and the QuickDASH,<sup>28</sup> a shortened version of the DASH Outcome Measure,<sup>31</sup> for participants with back pain and upper extremity pain, respectively. Scores on individual items of each scale were averaged, transformed to a score of 0 to 100, and converted to a  $z$  score. A higher standardized score was indicative of greater functional disability. Participants reporting both back and upper extremity pain completed each scale, and the instrument resulting in the highest  $z$  score was used as the index of functional status. Primary pain site (that is, back or upper extremity) was also based on the higher  $z$  score.

### **Work Loss Days**

To measure work loss days, both self-report and WSIB administrative data were used. Self-reported work absence duration reflected the total number of full workdays missed owing to workplace injury at baseline. Duration of wage replacement benefits, measured using WSIB administrative data, captured the cumulative number of calendar days receiving full disability wage replacement benefits (given to a worker who is completely off work and receiving 100% compensation) from injury date to 180 days postinjury.

### **Sociodemographics and Workplace Factors**

During the baseline interview, participants were asked to provide information on sociodemographic characteristics, including age, sex, and education level, as well as workplace and injury factors, such as work hours and current working status. Collar classification and industrial sector were extracted from WSIB administrative data and described elsewhere.<sup>21</sup>

### **Analyses**

Analyses were restricted to participants who did not report receiving a depression diagnosis in the year before injury ( $n = 599$  at baseline;  $n = 430$  at 6-month follow-up) in an effort to restrict the sample to workers with no preinjury mental health issues. However, descriptive analyses for baseline sociodemographics, workplace, injury, and health care characteristics, and 6-month attrition bias analyses were conducted for all baseline participants ( $n = 632$ ).

The crude point prevalence of high levels of depressive symptoms was computed at baseline and 6 months postinjury, along with mean and median CES-D scores and

the standard deviation of the mean scores. The course of depressive symptoms was examined longitudinally by categorizing participants based on their pattern of depressive symptom levels at baseline and 6 months postinjury. At baseline, 2 groups were created: participants who scored less than 16 on the CES-D ( $n = 250$ ) and participants who scored 16 or more on the CES-D ( $n = 180$ ). These groups were further categorized at 6 months postinjury into 4 groups: stable low-level group—low levels at baseline and 6 months; emerging high-level group (incident cases)—low levels at baseline, high levels at 6 months; resolving-level group—high levels at baseline, low levels at 6 months; and persisting high-level group—high levels at baseline and 6 months. Mean, standard deviation, and median change in CES-D score for each group were calculated. Within each group, a Student *t* test was conducted comparing the difference between baseline and 6-month mean CES-D scores to examine if the expected magnitude and direction of changes would be obtained. Both prevalence and course estimates were stratified by sex and RTW status, and 95% confidence intervals were calculated. Sensitivity analyses were also conducted to examine the impact of using a cut-off score of 19, which has been previously validated for patients with chronic pain.<sup>32</sup>

Correlations between constructs expected to be associated with depression were examined for both time points, namely, pain levels (baseline and 6 months) and functional status (baseline only).

The crude 6-month period prevalence of a depression diagnosis and the crude point prevalence of mental health treatment (antidepressant use and speaking with a health professional) at 6 months were calculated, along with 95% confidence intervals. These estimates were stratified by sex, depressive symptom levels at 6 months, and the 4 groups describing the course of depressive symptoms. Estimates of current treatment use were stratified by receipt of a depression diagnosis since injury. All analyses were conducted using SAS version 9.1.<sup>33</sup>

## Results

Selection bias analyses conducted with WSIB data and described elsewhere<sup>20</sup> revealed study participants and nonparticipants were generally comparable. However, participants were more likely to be older and women, and participants with accepted claims were more likely to be receiving wage replacement benefits for a longer duration and to have a higher rate of reinstatement of wage replacement benefits at 6 months postinjury than nonparticipants.

Baseline characteristics of the total sample ( $n = 632$ ) are presented in Table 1. Mean age of participants was 42.2 years (SD 10.8) and 55% of participants were men.

A total of 446 participants completed the 6-month follow-up interview for an overall follow-up rate of 70.6%. An attrition bias analysis (Table 1) comparing respondents ( $n = 446$ ) with nonrespondents (that is, lost to follow-up) ( $n = 186$ ) of the 6-month interview revealed that nonrespondents were more likely to work longer hours at injury, and to specify their back as the primary pain site. Moreover, male nonrespondents tended to be younger than male respondents, whereas in women, differences in age were not as apparent. Otherwise, nonrespondents did not differ significantly from respondents with respect to other variables, including mean CES-D scores.

The mean CES-D score in the total sample was 15.5 (SD 12.1) at baseline and 11.1 (SD 12.9) at the 6-month follow-up (Table 2). At baseline, 42.9% (95% CI 38.9% to 46.9%) of participants reported high levels of depressive symptoms. By 6 months, the proportion reporting high levels dropped to 26.5% of participants (95% CI 22.3% to 30.7%). At both baseline and 6 months, high levels of depressive symptoms were more likely to be present in RTW-R and No RTW participants (baseline 54.7%; 6 months 38.6%) than in RTW-S participants (baseline 30.0%; 6 months 17.7%) (Table 2).

Among those participants with low levels of depressive symptoms at baseline, 11.6% (95% CI 7.6% to 15.6%) had emerging high levels at 6-month follow-up (Table 3a). Of the participants with high levels of depressive symptoms at baseline (Table 3b), 52.8% (95% CI 45.5% to 60.1%) experienced a resolution of symptoms and 47.2% (95% CI 39.9% to 54.5%) a persistence of symptoms at the 6-month follow-up. As expected, small mean changes in the CES-D were seen in participants with stable low levels and persisting high levels, while large mean increases and decreases were reported by participants with emerging high levels and resolving levels, respectively (Tables 3a and 3b).

At 6-month follow-up, persistence of high levels of depressive symptoms was more likely to occur in RTW-R and No RTW participants, compared with RTW-S participants (Table 3b). This trend was also present for participants with emerging high levels of depressive symptoms (Table 3a).

Sensitivity analyses using a CES-D cut-off of 19 (data not shown) showed that using this higher cut-off score had very little impact on rates of high levels of depressive symptoms in the 4 depressive course groups examined, and in the RTW status groups examined (details available from author).

Correlations between pain levels, functional status, and depressive symptoms were strongly associated, as expected (data not shown). Correlations were all statistically significant, most at the  $P < 0.0001$  level, except the correlation between usual pain level at baseline and 6-month CES-D score, and ranged between 0.12 and 0.86. As expected,

**Table 1 Baseline characteristics and comparison of 6-month follow-up respondents with nonrespondents**

Variable <sup>a</sup>	All baseline respondents ( <i>n</i> = 632) <i>n</i> (%)	6-month follow-up respondents ( <i>n</i> = 446) <i>n</i> (%)	6-month follow-up nonrespondents ( <i>n</i> = 186) <i>n</i> (%)	$\chi^2$ (df), <i>P</i>
<b>Sex × Age, years</b>				
Women				3.96 (3), 0.27
15–29	40 (14.2)	27 (13.0)	13 (17.6)	
30–39	59 (20.9)	40 (19.2)	19 (25.7)	
40–49	109 (38.7)	81 (38.9)	28 (37.8)	
≥50	74 (26.2)	60 (28.9)	14 (18.9)	
Men				31.49 (3), <0.001
15–29	54 (15.4)	30 (12.6)	24 (21.4)	
30–39	78 (22.3)	38 (16.0)	40 (35.7)	
40–49	119 (34.0)	86 (36.1)	33 (29.5)	
≥50	99 (28.3)	84 (35.3)	15 (13.4)	
<b>Education</b>				5.59 (3), 0.13
Some high school	112 (17.7)	71 (15.9)	41 (22.0)	
Completed high school	177 (28.0)	122 (27.4)	55 (29.6)	
Some post-secondary	130 (20.6)	92 (20.6)	38 (20.4)	
Post-secondary or at least some graduate	213 (33.7)	161 (36.1)	52 (28.0)	
<b>Number of hours working per week at time of injury</b>				9.76 (2), 0.008
≤37.5	179 (28.3)	142 (31.8)	37 (19.9)	
>37.5–40	281 (44.5)	192 (43.1)	89 (47.9)	
>40	172 (27.2)	112 (25.1)	60 (32.2)	
<b>Occupational classification (WSIB data)<sup>b</sup></b>				3.83 (4), 0.43
White collar	109 (20.3)	84 (22.1)	25 (16.0)	
Pink collar	209 (39.0)	149 (39.2)	60 (38.5)	
Blue collar–indoor	132 (24.6)	87 (22.9)	45 (28.8)	
Blue collar–outdoor	86 (16.1)	60 (15.8)	26 (16.7)	
<b>Industrial sector (WSIB data)</b>				8.18 (7), 0.32
Automotive, manufacturing, steel	120 (19.0)	78 (17.5)	42 (22.6)	
Service	141 (22.3)	97 (21.8)	44 (23.7)	
Health care	92 (14.6)	67 (15.1)	25 (13.4)	
Transportation	59 (9.4)	39 (8.8)	20 (10.7)	
Chemical or processing, electrical, food	35 (5.6)	24 (5.4)	11 (5.9)	
Construction	16 (2.5)	13 (2.9)	3 (1.6)	
Agriculture, forest, pulp and paper, mining	17 (2.7)	10 (2.2)	7 (3.8)	
Education, governments, railways, airlines, shipping, telephone companies	151 (23.9)	117 (26.3)	34 (18.3)	
<b>Working status</b>				0.12 (1), 0.73
Working at 1 month postinjury	333 (52.7)	233 (52.2)	100 (53.8)	
Not working at 1 month postinjury	299 (47.3)	213 (47.8)	86 (46.2)	
<b>Primary pain site</b>				4.88 (1), 0.03
Back	418 (66.1)	283 (63.5)	135 (72.6)	
Upper extremities	214 (33.9)	163 (36.5)	51 (27.4)	

continued

Table 1 continued

Variable <sup>a</sup>	All baseline respondents ( <i>n</i> = 632) Mean (SD), median	6-month follow-up respondents ( <i>n</i> = 446) Mean (SD), median	6-month follow-up nonrespondents ( <i>n</i> = 186) Mean (SD), median	<i>t</i> ( <i>df</i> ), <i>P</i>
Self-reported work absence duration at 1-month interview (standardized to a 30 day period)	14.5 (7.1), 14.0	15.2 (7.7), 15.0	14.9 (6.7), 15.5	0.39 (307), 0.70
Duration of time receiving wage replacement benefits for days on 100% compensation (180 days postinjury) (WSIB data) <sup>c</sup>	46.4 (50.1), 24.0	45.3 (48.6), 25.0	49.1 (53.7), 22.0	0.81 (557), 0.42
Von Korff Pain Scale item on current pain intensity	4.8 (2.7), 5.0	4.7 (2.7), 5.0	5.0 (2.8), 5.0	1.02 (630), 0.31
CES-D	16.1 (12.5), 14.0	15.8 (12.3), 13.0	17.0 (12.9), 15.0	1.09 (630), 0.28
Functional disability scale				
Roland Morris (for back injuries)	62.5 (26.9), 70.8	62.8 (26.2), 70.8	62.0 (28.5), 70.8	0.29 (416), 0.77
QuickDASH (for upper extremity injuries)	55.7 (23.1), 56.8	56.1 (22.0), 56.8	54.7 (26.6), 56.8	0.37 (212), 0.71

<sup>a</sup> Data are based on self-reported interview data collected at baseline (about 1 month postinjury) unless otherwise specified.

<sup>b</sup> Data are restricted to participants with accepted claims and complete data (*n* = 380 for those who completed the 6-month follow-up and *n* = 156 for those lost to follow-up).

<sup>c</sup> Data are restricted to participants with accepted claims and available wage replacement data (*n* = 395 for those who completed the 6-month follow-up and *n* = 164 for those lost to follow-up).

correlations were higher when assessments were conducted at the same time.

Regarding diagnosis and treatment, 13.2% (95% CI 7.0% to 19.4%) of participants with high levels of depressive symptoms at 6 months and 12.9% (95% CI 5.8% to 20.1%) of those with persistently high levels of depressive symptoms between 1 and 6 months reported receiving a depression diagnosis since injury (Table 4). At 6-month follow-up, 16.8% (95% CI 9.9% to 23.7%) of participants with high levels of depressive symptoms reported current use of antidepressants and 14.9% (95% CI 8.4% to 21.5%) were currently consulting a health professional regarding their mental health (Table 4). Among those with persistently high levels of depressive symptoms, 23.8% (95% CI 14.7% to 32.9%) were using antidepressants and (or) consulting a health professional about their mental health. When a postinjury diagnosis of depression was reported, the proportion of participants either using antidepressants or consulting with a health professional increased to 72.7% (95% CI 54.1% to 91.3%).

## Discussion

Our findings suggest that high levels of depressive symptoms are pervasive in workers with work-related musculoskeletal injuries, particularly in the immediate weeks following injury, and in workers with problematic RTW trajectories (that is,

RTW with recurrence[s] and No RTW). Further, workers presenting with high levels of depressive symptoms early on are equally likely to experience persistence or resolution of symptoms within 6 months postinjury. For those whose depressive symptoms persist over 6 months, underdiagnosis and undertreatment are an important problem.

Injured workers with high depressive symptoms present with a constellation of other characteristics, namely, high pain levels and low functional status. The cooccurrence of pain and functional disability with depressive symptoms is expected, but does not diminish the significance of high rates of depressive symptoms.

Our finding of a high prevalence of depressive symptoms is consistent with results of previous studies of musculoskeletal-injured workers.<sup>10,11</sup> Keogh et al<sup>11</sup> also used the CES-D Scale to measure depressive symptom levels and found 31% of compensation claimants had high levels of depressive symptoms 1 to 4 years postinjury. In the general working and community populations, CES-D prevalence estimates range from 14% to 23%<sup>34,35</sup> and 11% to 25%,<sup>23,36,37</sup> respectively. Taken together, results suggest depressive symptoms are more prevalent in injured workers than in the general population, especially shortly after injury. Given that women are more often afflicted with depression,<sup>38</sup> we stratified our prevalence estimates by sex. Prevalence estimates in

**Table 2 Estimated prevalence of high levels of depressive symptoms and mean CES-D scores (SD) at baseline and 6 months postinjury**

Sample	Baseline ( <i>n</i> = 599)			
	Prevalence of high levels of depressive symptoms			Mean CES-D score
	<i>n</i>	Total <i>n</i>	% (95% CI)	Mean (SD), median
Total	257	599	42.9 (38.9–46.9)	15.5 (12.1), 13.0
Sex				
Men	126	333	37.8 (32.6–43.1)	13.8 (10.6), 12.0
Women	131	266	49.3 (43.2–55.3)	17.5 (13.5), 15.0
RTW status at baseline				
RTW-S	85	283	30.0 (24.7–35.4)	12.2 (11.1), 9.0
RTW-R or No RTW	169	309	54.7 (49.1–60.2)	18.5 (12.3), 17.0
RTW status at 6 months				
RTW-S	—	—	—	—
RTW-R or No RTW	—	—	—	—
Sample	6 months postinjury ( <i>n</i> = 430)			
	Prevalence of high levels of depressive symptoms			Mean CES-D score
	<i>n</i>	Total <i>n</i>	% (95% CI)	Mean (SD) median
Total	114	430	26.5 (22.3–30.7)	11.1 (12.9), 6.0
Sex				
Men	53	232	22.8 (17.4–28.3)	9.6 (11.6), 5.0
Women	61	198	30.8 (24.4–37.2)	12.8 (14.0), 7.0
RTW status at baseline				
RTW-S	—	—	—	—
RTW-R or No RTW	—	—	—	—
RTW status at 6 months				
RTW-S	43	243	17.7 (12.9–22.5)	8.1 (10.4), 4.0
RTW-R or No RTW	71	184	38.6 (31.6–45.6)	15.0 (14.8), 10.0
Denominators vary up to 7 cases owing to missing data. — = not applicable				

men, particularly at baseline (37.8%), remained higher than estimates seen in men in community (10.8% to 17.7%)<sup>23,36</sup> and working populations (15%).<sup>34</sup> By 6 months, prevalence estimates in our sample, although still somewhat high, appeared to be returning to what would be expected in community and general working populations.

For injured workers unable to attempt or sustain a full RTW, depressive symptoms are even more problematic. In our study, whether depressive symptoms contributed to or were the result of a delayed RTW could not be ascertained. Presumably, returning to the workforce and resuming regular routines can have a positive impact on injured workers' mental health, especially for those able to maintain an RTW.

However, higher levels of depressive symptoms can develop in those facing adversity and struggling when returning to work, making recurrences of work disability more likely.

About one-half of all workers with high levels of depressive symptoms early on experienced a persistence of these symptoms at 6 months, while the other half experienced a resolution. This rate of resolution is consistent with the 6-month recovery rates of clinical depression seen in patient and general population studies (54% to 63%).<sup>39–41</sup> Chronicity of depressive symptoms has been found to be associated with the following risk factors: severity of symptoms, antidepressant use, poorer self-reported quality of life, lower social support, presence of key life events, lower education level,



**Table 3a Estimated course of depressive symptoms with mean change (SD) in CES-D scores from baseline to 6 months postinjury among participants with low levels of depressive symptoms at baseline (*n* = 250)**

Stable low levels of depressive symptoms at 6 months (from low to low)					
Sample	<i>n</i>	Total <i>n</i>	% (95% CI)	Mean CES-D Δ (SD), median	<i>t</i> (df)
Total	221	250	88.4 (84.4–92.4)	–3.3 (4.8), –3.0	10.32 (220) <sup>a</sup>
Sex					
Men	133	147	90.5 (85.7–95.2)	–3.5 (4.8), –3.0	8.41 (132) <sup>a</sup>
Women	88	103	85.4 (78.6–92.3)	–3.1 (4.8), –3.0	5.99 (87) <sup>a</sup>
RTW status at baseline					
RTW-S	128	145	88.3 (83.0–93.5)	–2.7 (4.5), –2.5	6.79 (127) <sup>a</sup>
RTW-R or No RTW	91	103	88.4 (82.2–94.6)	–4.2 (5.1), –4.0	7.75 (90) <sup>a</sup>
RTW status at 6 months					
RTW-S	141	154	91.6 (87.2–96.0)	–3.1 (4.3), –3.0	8.68 (140) <sup>a</sup>
RTW-R or No RTW	79	95	83.2 (75.6–90.7)	–3.8 (5.7), –4.0	5.87 (78) <sup>a</sup>
Emerging high levels of depressive symptoms at 6 months (from low to high)					
Sample	<i>n</i>	Total <i>n</i>	% (95% CI)	Mean CES-D Δ (SD), median	<i>t</i> (df)
Total	29	250	11.6 (7.6–15.6)	14.0 (7.3), 11.0	10.36 (28) <sup>a</sup>
Sex					
Men	14	147	9.5 (4.8–14.3)	13.1 (6.0), 10.5	8.15 (13) <sup>a</sup>
Women	15	103	14.6 (7.8–21.4)	14.9 (8.4), 12.0	6.83 (14) <sup>a</sup>
RTW status at baseline					
RTW-S	17	145	11.7 (6.5–17.0)	14.5 (7.6), 12.0	7.82 (16) <sup>a</sup>
RTW-R or No RTW	12	103	11.7 (5.5–17.9)	13.4 (7.1), 11.0	6.56 (11) <sup>a</sup>
RTW status at 6 months					
RTW-S	13	154	8.4 (4.1–12.8)	11.6 (5.7), 10.0	7.30 (12) <sup>a</sup>
RTW-R or No RTW	16	95	16.8 (9.3–24.4)	16.0 (8.0), 14.5	8.01 (15) <sup>a</sup>

<sup>a</sup> *P* < 0.001

unemployment,<sup>42</sup> longer duration of previous episodes, and presence of chronic physical illness.<sup>43</sup> It is likely the same risk factors apply to injured workers. As well, for some injured workers, transient depressive symptoms with subsequent resolution may be a reaction to a physical injury, independent of injury type or compensation system—similar findings have been reported for motor vehicle accident claimants with whiplash.<sup>44</sup> For these workers, resolution of depressive symptoms may not require specialty mental health services, and supportive counselling by a health professional may be adequate.

Undetected depression is a well-known phenomenon in primary care.<sup>13–18</sup> We found a similar pattern of underdiagnosis in our sample of injured workers. Low diagnosis rates may be attributed to several reasons. At the individual worker level, possible reasons include delayed help-seeking owing to poor

self-awareness of depressive symptoms, unwillingness to disclose problems, concern over stigma,<sup>45,46</sup> and possible fear of losing compensation benefits through symptom disclosure. Workers are also presumably more likely to consult their physicians for injury-related physical issues than for depressive symptoms. As such, they may discuss their physical and pain-related symptoms more openly than depressive symptoms.<sup>46</sup>

Nondetection of depression may also be due to health care provider behaviour, as a result of lack of knowledge and skills regarding assessment of mental health issues, preoccupation with the worker's physical health problems, and time demands of the provider's practice.<sup>45,46</sup> Finally, given the self-reported nature of the CES-D and the variable specificity of the instrument, a CES-D Scale score of 16 or above is not

**Table 3b Estimated course of depressive symptoms with mean change (SD) in CES-D scores from baseline to 6 months postinjury among participants with high levels of depressive symptoms at baseline ( $n = 180$ )**

Resolving levels of depressive symptoms at 6 months (from high to low)					
Sample	<i>n</i>	Total <i>n</i>	% (95% CI)	Mean CES-D $\Delta$ (SD), median	<i>t</i> (df) <sup>a</sup>
Total	95	180	52.8 (45.5–60.1)	–18.7 (9.3), –17.0	19.73 (94) <sup>a</sup>
Sex					
Men	46	85	54.1 (43.5–64.7)	–16.5 (9.0), –15.5	2.39 (45) <sup>a</sup>
Women	49	95	51.6 (41.5–61.6)	–20.8 (9.1), –19.0	16.11 (48) <sup>a</sup>
RTW status at baseline					
RTW-S	27	56	48.2 (35.1–61.3)	–18.9 (8.7), –17.0	11.31 (26) <sup>a</sup>
RTW-R or No RTW	67	122	54.9 (46.1–63.8)	–18.9 (9.5), –17.0	16.25 (66) <sup>a</sup>
RTW status at 6 months					
RTW-S	59	89	66.3 (56.5–76.1)	–18.4 (8.5), –17.0	16.73 (58) <sup>a</sup>
RTW-R or No RTW	34	89	38.2 (28.1–48.3)	–19.5 (10.8), –16.5	10.49 (33) <sup>a</sup>
Persisting high levels of depressive symptoms at 6 months (from high to high)					
Sample	<i>n</i>	Total <i>n</i>	% (95% CI)	Mean CES-D $\Delta$ (SD), median	<i>t</i> (df), <i>P</i>
Total	85	180	47.2 (39.9–54.5)	2.8 (11.6), 2.0	2.24 (84), 0.03
Sex					
Men	39	85	45.9 (35.3–56.5)	3.0 (9.5), 2.0	1.98 (38), 0.06
Women	46	95	48.4 (38.4–58.5)	2.6 (13.2), 3.5	1.35 (45), 0.18
RTW status at baseline					
RTW-S	29	56	51.8 (38.7–64.9)	0.8 (11.1), 1.0	0.39 (28), 0.70
RTW-R or No RTW	55	122	45.1 (36.3–53.9)	4.0 (11.9), 4.0	2.50 (54), 0.02
RTW status at 6 months					
RTW-S	30	89	33.7 (23.9–43.5)	2.2 (13.6), 1.5	0.90 (29), 0.38
RTW-R or No RTW	55	89	61.8 (51.7–71.9)	3.1 (10.4), 3.0	2.22 (54), 0.03

<sup>a</sup>  $P < 0.001$ 

necessarily indicative of a clinical depressive episode, but remains nevertheless indicative of a concerning high level of depressive symptoms.<sup>47,48</sup>

In our study, receiving a depression diagnosis was a key factor to receiving treatment. However, a sizable proportion of workers reporting a diagnosis of depression failed to receive treatment, suggesting undertreatment even among those recognized by a physician as having depression. This finding is consistent with other studies where rates of treatment among workers with a depression diagnosis have been inadequate.<sup>49,50</sup> Possible causes for undertreatment are similar to those for underdiagnosis previously discussed, but in addition may include a worker's readiness for and adherence to treatment, high treatment costs, lack of follow-up care, difficult access to mental health services, and lack of integration of mental health services.<sup>45,46</sup> It should be kept in mind as well that antidepressants were probably prescribed, at times, for

pain management and not for depression, and at doses that are not considered sufficient to treat depression. Typically, the therapeutic dosage of antidepressants for pain management is much lower than that used for treatment of depression.

We have prospectively followed workers after a work-related musculoskeletal injury and documented the course of depressive symptoms and associated mental health care use, therefore addressing significant gaps in the injured worker literature. One strength of our study is that workers with a preinjury diagnosis of depression were excluded from analyses. Though this exclusion does not permit a definitive conclusion that mental health issues began postinjury, particularly given current rates of underdiagnosis, it does reduce the likelihood that workers were already experiencing significant depressive symptoms prior to injury.

**Table 4 Prevalence of depression diagnosis and treatment at 6 months postinjury (*n* = 430)**

Sample	Received a depression diagnosis since injury ( <i>n</i> = 430)			Using antidepressants ( <i>n</i> = 429)		
	<i>n</i>	Total <i>n</i>	% (95%CI)	<i>n</i>	Total <i>n</i>	% (95% CI)
Total	22	430	5.1 (3.0–7.2)	34	429	7.9 (5.4–10.5)
Sex						
Men	6	232	2.6 (0.5–4.6)	11	231	4.8 (2.0–7.5)
Women	16	198	8.1 (4.3–11.9)	23	198	11.6 (7.2–16.1)
Level of depressive symptoms at 6 months						
Low	7	316	2.2 (0.6–3.8)	15	316	4.8 (2.4–7.1)
High	15	114	13.2 (7.0–19.4)	19	113	16.8 (9.9–23.7)
Course of depressive symptoms between baseline and 6 months						
Stable low (from low to low)	2	221	0.9 (0.0–2.2)	9	221	4.1 (1.5–6.7)
Emerging high (from low to high)	4	29	13.8 (1.2–26.3)	2	29	6.9 (0.0–16.1)
Resolving (from high to low)	5	95	5.3 (0.8–9.8)	6	95	6.3 (1.4–11.2)
Persisting high (from high to high)	11	85	12.9 (5.8–20.1)	17	84	20.2 (11.7–28.8)
Diagnosis of depression since injury						
Not diagnosed	—	—	—	20	407	4.9 (2.8–7.0)
Diagnosed	—	—	—	14	22	63.6 (43.5–83.7)
Sample	Currently speaking with a health professional about emotional or mental health ( <i>n</i> = 430)			Using antidepressants and (or) speaking with a health professional about emotional or mental health ( <i>n</i> = 429)		
	<i>n</i>	Total <i>n</i>	% (95%CI)	<i>n</i>	Total <i>n</i>	% (95% CI)
Total	21	430	4.9 (2.9–6.9)	41	429	9.6 (6.8–12.3)
Sex						
Men	5	232	2.2 (0.3–4.0)	13	231	5.6 (2.7–8.6)
Women	16	198	8.1 (4.3–11.9)	28	198	14.1 (9.3–19.0)
Level of depressive symptoms at 6 months						
Low	4	316	1.3 (0.0–2.5)	18	316	5.7 (3.1–8.3)
High	17	114	14.9 (8.4–21.5)	23	113	20.4 (12.9–27.8)
Course of depressive symptoms between baseline and 6 months						
Stable low (from low to low)	2	221	0.9 (0.0–2.2)	11	221	5.0 (2.1–7.8)
Emerging high (from low to high)	3	29	10.3 (0.0–21.4)	3	29	10.3 (0.0–21.4)
Resolving (from high to low)	2	95	2.1 (0.0–5.0)	7	95	7.4 (2.1–12.6)
Persisting high (from high to high)	14	85	16.5 (8.6–24.4)	20	84	23.8 (14.7–32.9)
Diagnosis of depression since injury						
Not diagnosed	8	408	2.0 (0.6–3.3)	25	407	6.1 (3.8–8.5)
Diagnosed	13	22	59.1 (38.6–79.6)	16	22	72.7 (54.1–91.3)

Denominators vary up to one case due to missing data.  
— = not applicable

Another strength in our study is that comprehensive selection<sup>20</sup> and attrition bias analyses were conducted, and point to limited systematic biases in our sample. The generalizability of results may be limited for younger workers, workers with a shorter work absence duration, and men. As well, given the inclusion criteria, our results may not apply to workers with more severe injuries.

Study limitations include small sample sizes and the self-reported nature of depression diagnosis and treatment, which might have affected the accuracy of some estimates. Results of studies examining the concordance of diagnosis and treatment data obtained by self-report and administrative records have been conflicting, suggesting both poor<sup>51</sup> and good<sup>52</sup> concordance between the 2 data sources.

The potential low specificity of the CES-D Scale may have led to a high number of false positives in terms of indexing true clinical depression. Therefore, our results require replication with a validated diagnostic structured interview. However, a previous study<sup>25</sup> suggests that false positives produced by the CES-D could largely be due to the exclusion criteria of the diagnostic interview that are not part of the CES-D, namely, presence of role impairment and a requirement the patient sought medical attention. Use of a cut-off score to categorize depressive symptoms may also be a limitation as important changes in the CES-D score may be overlooked if the pre-determined threshold of 16 is not crossed. However, our analyses showed that mean changes in the CES-D scores were in the direction and magnitude expected, and sensitivity analyses showed that changing the cut-off score to 19 to define high depressive symptom levels did not alter our results substantively.

## Conclusions

Our study makes a case for directing clinicians' and policy-makers' attention toward the mental health of injured workers. Injured workers with problematic RTW trajectories appear to be a group particularly vulnerable to depressive symptoms. After a workplace injury, workers face multiple losses: loss of income, functional ability, health, and quality of life. For some, depressive symptoms seem to be an expected initial reaction to injury as it would be to other traumatic life events. For others, symptoms are persistent and associated with significant impairment. We still need to understand what distinguishes an expected transient reaction to a workplace injury from a problematic reaction, and within what time frame. While early treatment may not be appropriate for transient depressive symptoms, physician awareness of persistence in symptoms will help to identify workers who may benefit from further assessment and specialty mental health intervention. Future research should investigate

treatment, workplace-based, psychological, and social factors facilitating resolution of depressive symptoms.

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**Résumé : Le cours, le diagnostic, et le traitement de la symptomatologie dépressive chez les travailleurs suivant un accident du travail : une étude de cohorte prospective**

**Objectifs :** Estimer la prévalence, l'incidence, et le cours des symptômes dépressifs et la prévalence des traitements de santé mentale suivant un accident du travail, et estimer l'association entre les symptômes dépressifs et les trajectoires de retour au travail (RAT).

**Méthode :** Dans une étude de cohorte prospective, des travailleurs demandant une indemnisation de temps perdu pour un trouble musculo-squelettique du dos ou des membres supérieurs lié au travail ont été interviewés 1 mois ( $n = 599$ ) et 6 mois ( $n = 430$ ) après l'accident. Un taux élevé de symptômes dépressifs était défini à 16 ou plus à l'échelle de dépression du centre d'études épidémiologiques (CES-D) autodéclarée. Les estimations suivantes sont présentées : prévalence des taux élevés de symptômes dépressifs à 1 et 6 mois après l'accident; incidence, résolution, et persistance des taux élevés de symptômes dépressifs entre 1 et 6 mois; et prévalence des traitements de santé mentale autodéclarés et du diagnostic de dépression à 6 mois après l'accident.

**Résultats :** La prévalence des taux élevés de symptômes dépressifs à 1 mois et 6 mois après l'accident était de 42,9 % (95 % IC 38,9 % à 46,9 %) et de 26,5 % (95 % IC 22,3 % à 30,7 %), respectivement. Parmi les participants déclarant des taux élevés de symptômes dépressifs à 1 mois après l'accident, 47,2 % (95 % IC 39,9 % à 54,5 %) avaient des symptômes persistants 6 mois après l'accident. Après 6 mois, 38,6 % des travailleurs qui ne sont jamais retournés au travail ou qui avaient des reprises d'invalidité présentaient des taux élevés de symptômes dépressifs, comparativement aux 17,7 % de ceux qui avaient une trajectoire soutenue de RAT. Au suivi de 6 mois, 12,9 % (95 % IC 5,8 % à 20,1 %) des participants ayant des taux élevés de symptômes dépressifs persistants auto-déclaraient un diagnostic de dépression depuis l'accident, et 23,8 % (95 % IC 14,7 % à 32,9 %) recevaient un traitement pour la dépression.

**Conclusions :** Les symptômes dépressifs sont prépondérants chez les travailleurs qui subissent des blessures musculo-squelettiques, mais ils sont transitoires pour certains, et rarement diagnostiqués ou traités comme une dépression.

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